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THE HYBRID SOLUTION

Power And Reliability In A Green Package

January 13, 2009

HYBRID TECHNOLOGY

Environmental stewardship and innovation

Efficient power delivery

- Optimizes power sources
- Utilization only when needed
- Run at or near design point for efficiency

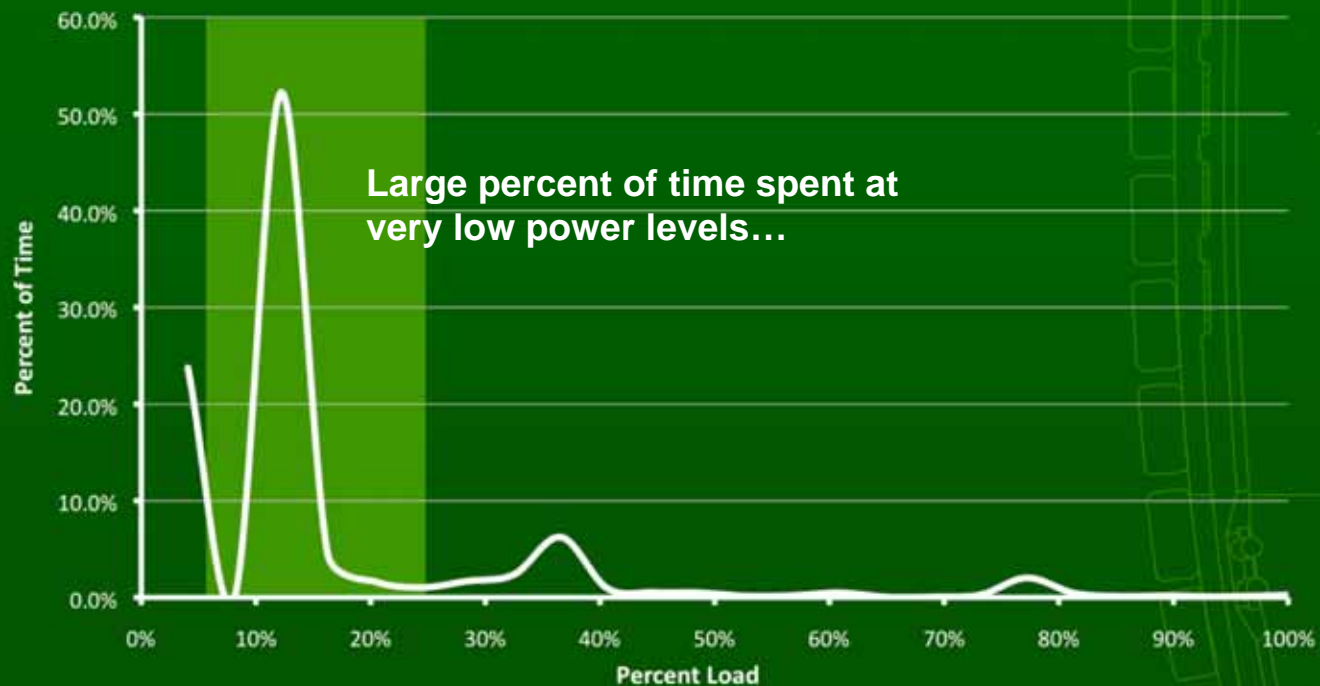
Lower fuel consumption

Efficient Combustion



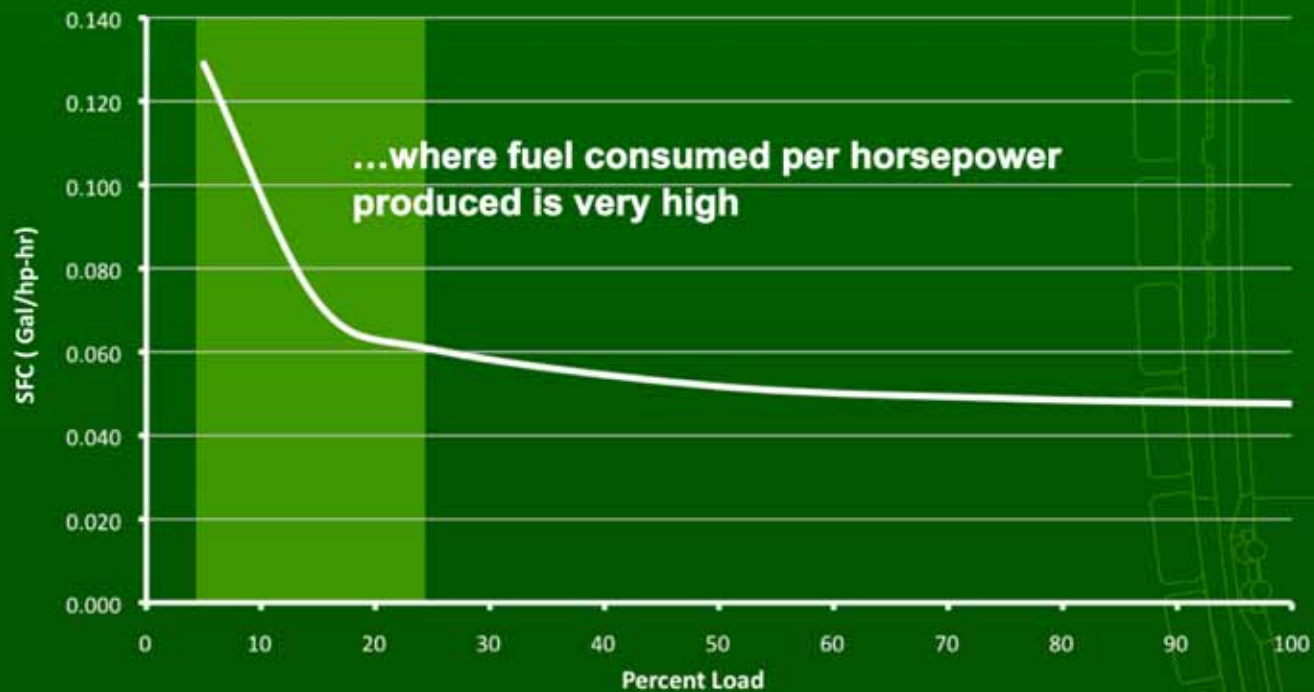
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THE HARBOR TUG DILEMMA



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THE HARBOR TUG DILEMMA



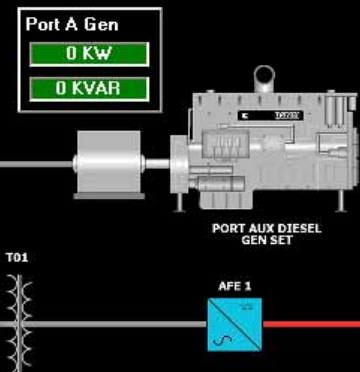
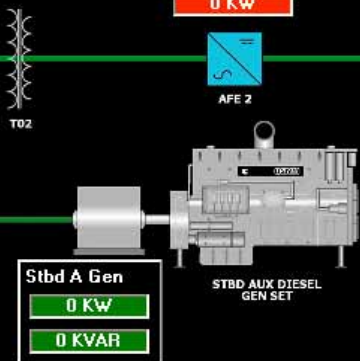
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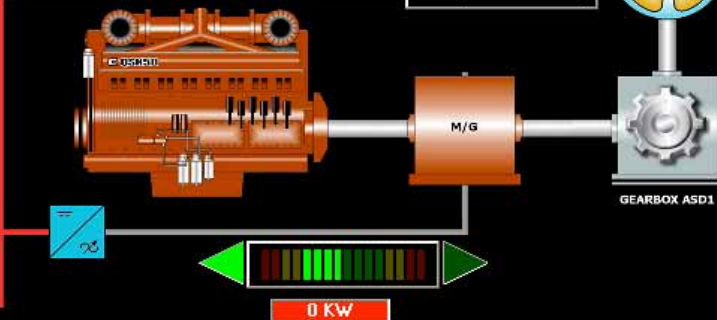
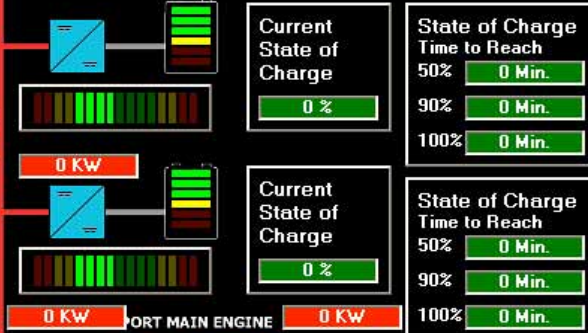
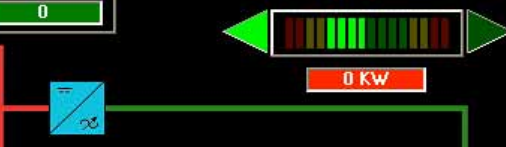
VS Bus
0 VAC
0.0 Hz
0.0 %

VESSEL SERVICE BUS



DCBus
0

DC BUS



Stbd Shaft Control



Percent CMD Speed 0 %
Actual Speed 0 %
Thrust 0 %

Stbd Prop

0 KW
0.0 Tons
0 RPM

Port Prop

0 KW
0.0 Tons
0 RPM

Port Shaft Control



Percent CMD Speed 0 %
Actual Speed 0 %
Thrust 0 %





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EMISSIONS REDUCTIONS

Compared with the operating duty cycle of the conventional Dolphin tugs in San Pedro Harbor



44%

NOx reduction
PM reduction



20-30%

CO2 reduction
SOx reduction

Batteries can be recharged using shore power



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ADDITIONAL BENEFITS

Fuel and lube savings of 20-30%

Reduced life cycle costs

Can act as a mobile power generating station

Reduced noise

Flexible design to take advantage of technology developments

Green Passport

Easily adaptable for retrofits as well as new builds



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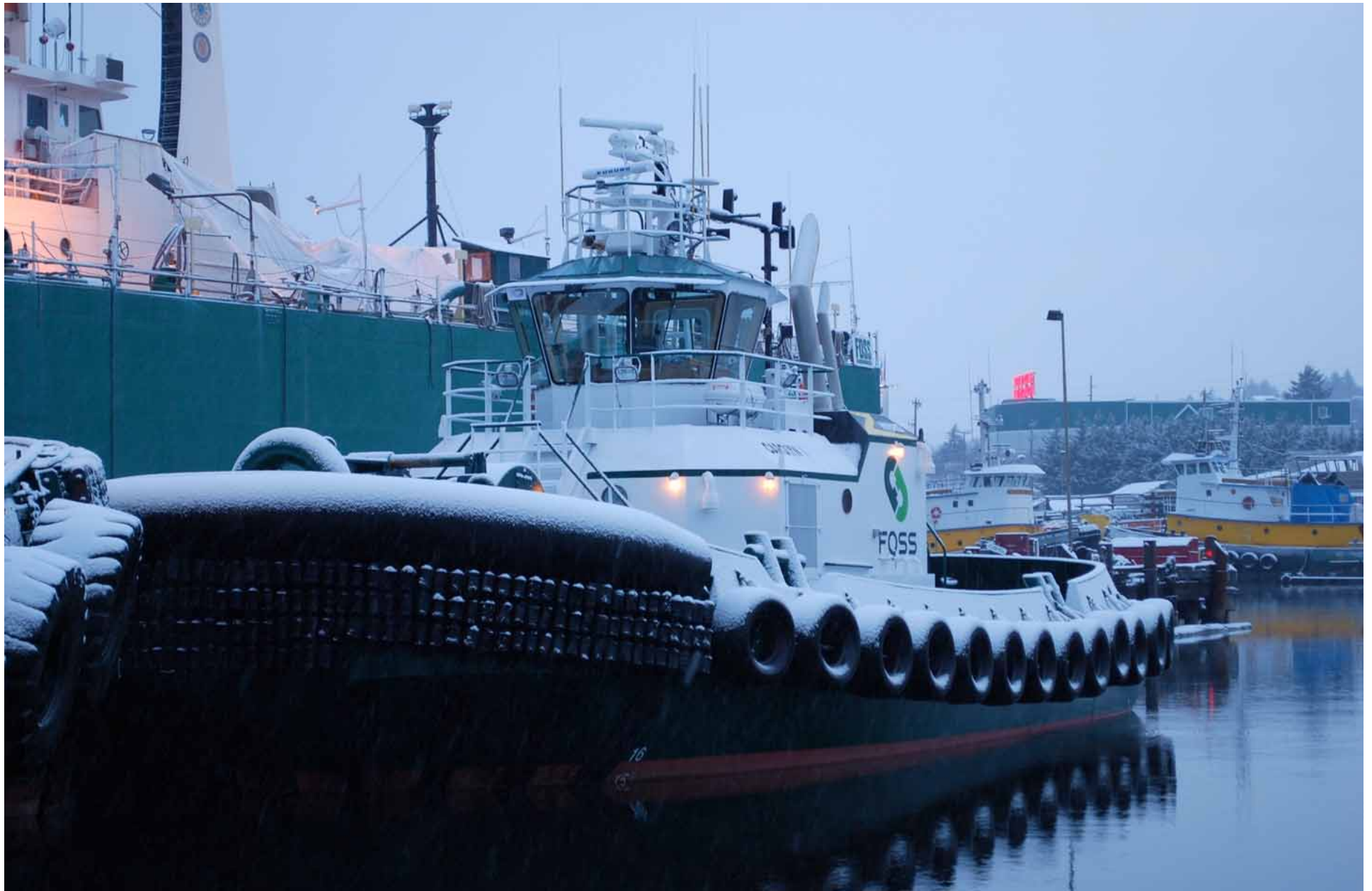
CONCLUSION

Additional Capital

- Public/Private Partnership

Application Dependant

Technology Advancement



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